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PATENT

Attorney Docket No. 207617
Client Reference No. 99106

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re Application of:

Dirksen et al.

Art Unit: 1765

Application No. 09/737,905

Examiner: V. Perez-Ramos

Filed: December 15, 2000

For: METHOD OF POLISHING OR
PLANARIZING A SUBSTRATE

APPELLANTS' APPEAL BRIEF

Commissioner for Patents
Washington, D.C. 20231

Dear Sir:

The following comprises Appellants' Brief on Appeal in support of the appeal of the decision of the Examiner of Group Art Unit 1765 per the final Office Action dated June 25, 2002. A Notice of Appeal was filed on October 18, 2002, and received by the United States Patent and Trademark Office on October 23, 2002, thereby making the appeal brief due on December 23, 2002. This Brief is transmitted in triplicate (37 C.F.R. 1.192(a)).

Real Party In Interest

The patent application that is the subject of this appeal is assigned to Cabot Microelectronics Corporation.

Related Appeals and Interferences

There are no appeals or interferences that are related to this appeal.

Status of Claims

Claims 1-16 are currently pending, are the subject of this appeal, and are set forth in the Appendix attached hereto.

Status of Amendments

The claim amendments filed subsequent to the final rejection have not been entered. The petition to correct inventorship filed subsequent to the final rejection has been entered.

Summary of Invention

The invention relates to a method of polishing a substrate comprising the use of a composition comprising a metal oxide abrasive and a liquid carrier, wherein the composition has a pH of about 7 or less and the metal oxide abrasive has a total surface hydroxyl group density no greater than about 3 hydroxyl groups per nm².

Issues

The issue on appeal is whether the subject matter of claims 1, 5-8, and 10-16 is obvious under 35 U.S.C. § 103(a) over U.S. Patent 5,664,990 (Adams) in view of U.S. Patent 5,114,881 (Kaneko).

Grouping of Claims

The appealed claims stand and fall together.

Argument

The final Office Action alleges that the subject matter of claims 1-16 is obvious under Section 103(a) in view of the combined disclosures of Adams and Kaneko. In particular, the Office Action relies on Adams for its disclosure of a method of polishing a substrate having a metal layer with a composition comprising a metal oxide abrasive and a liquid carrier, wherein the composition has a pH of about 5 or less, but recognizes that Adams does not disclose a metal oxide abrasive having a “total surface hydroxyl group density” no greater than about 3 hydroxyl groups per nm² as recited in the appealed claims. The Office Action relies on Kaneko for its recitation of a metal oxide (i.e., silica) having 0.1 to 4 hydroxyl groups. Despite the fact that Kaneko does not teach or suggest a method of polishing a substrate and does not disclose a polishing composition, the Office Action alleges that it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the disclosure of Adams by using the metal oxide of Kaneko so as to arrive at the present invention.

As is well-settled, in order to establish a prima facie case of obviousness, three basic criteria must be met: (a) there must be some suggestion or motivation to modify the reference or to combine reference teachings, (b) there must be a reasonable expectation of success, and (c) the prior art references must teach or suggest all the claim limitations. See e.g., M.P.E.P. § 2143.

(a) There Is No Suggestion Or Motivation To Combine The Cited References

The Section 103(a) rejection is improper because there is no suggestion or motivation to combine the references in such a way as to arrive at the claimed subject matter. In order to set forth a *prima facie* case of obviousness based on a combination of references under Section 103(a), the Office Action must identify a “clear and particular” teaching, suggestion, or motivation to combine the references. *In re Demiczak*, 175 F.3d 994, 999 (Fed. Cir. 1999), *abrogated on other grounds* by *In re Gartside*, 203 F.3d 1305, 1316, 53 U.S.P.Q. 2d 1769, 1769-1770 (Fed. Cir. 2000); *In re Rouffet*, 149 F.3d 1350, 1357 (Fed. Cir. 1998); *Uniroyal, Inc. v. Rudkin-Wiley Corp.*, 837 F.2d 1044, 1051 (Fed. Cir. 1988). As the Federal Circuit has stated, “combining prior art references without evidence of such a suggestion, teaching or motivation simply takes the inventor’s disclosure as a blueprint for piecing together the prior art to defeat patentability – the essence of hindsight.” *In re Demiczak*, 175 F.2d at 999.

In support of the Section 103(a) rejection, the Office Action alleges that it would have been obvious to one of ordinary skill in the art, at the time the invention was made, to apply the metal oxide of Kaneko to Adams “because the use of fine silica with a low total surface hydroxyl group density helps prevent cracking and fractures, which is extremely desirable in the art” (page 3 of the Office Action). Such a statement of “motivation” to combine the cited references is at best unclear, and at worst completely erroneous, and reflects a fundamental misunderstanding or misconstruance of the disclosures of the cited references.

Kaneko discloses the use of fine silica having 0.2 to 4 hydroxyl groups/nm² as a preferred starting material in a *method of producing ceramics*. Kaneko teaches that by using such a fine silica starting material, the ceramic materials formed therefrom will have fewer fractures and cracks. In particular, Kaneko teaches a method of producing ceramic materials involving combining the fine silica with an alkoxy silane reagent and optionally a binder to form a mixture, wherein the alkoxy silane reagent is deposited on the surface of the fine silica and the fine silica is partially agglomerated. The silica/alkoxy silane mixture is then molded (e.g., by pressing, extrusion, or injection molding) into a shape such as pellets, strands, or sheets. The “preform” thus obtained is then heated so as to promote a de-alcoholysis of the alkoxy silane with the silica. In such a de-alcoholysis reaction, the hydroxyl groups on the surface of the silica react with the alkoxy silane to form a siloxane (Si-O-Si) bond. After de-hydrolysis, the ceramic preform is sintered to convert the mixture into a ceramic material, for example, an optical glass, a belljar, a crucible, or a semiconductor product. The ceramic material disclosed by Kaneko contains less water, and, therefore, the ceramic product has a lower occurrence of fracturing and/or cracking. Kaneko does not even remotely teach or suggest the use of the fine silica in a *method of polishing a substrate*. In fact, there is *absolutely nothing* in Kaneko that suggests that the fine silica, which is taught for use in a

process of producing ceramic products, could be used *in any other field*, and especially a method of polishing a substrate such as the method recited in the pending claims.

Similarly, there is nothing in Adams that suggests the combination of the cited references. Adams discloses a method of recycling polishing slurry during chemical-mechanical polishing of semiconductor substrates. Adams describes many different polishing compositions for various types of semiconductor substrates in the background section of the patent. None of the polishing compositions disclosed by Adams contains a metal oxide having a surface hydroxyl group density of no greater than about 3 hydroxyl groups per nm², as recited in the appealed claims. In fact, nowhere in the disclosure of Adams is there any suggestion that the surface hydroxyl group density of the abrasive is even important. Moreover, nothing in Adams suggests that suitable polishing compositions might include metal oxides from nonanalogous fields, such as metal oxides that are known as useful starting materials for preparing ceramic materials.

The technologies disclosed by Kaneko and Adams, in particular the method of producing ceramic materials and the method of chemical-mechanical polishing, clearly pertain to nonanalogous fields. As discussed above, there is nothing in either reference to support the combination of their disclosures. Indeed, the only connection between the cited references seems to be the fact that Adams discloses polishing compositions for use in polishing various substrates and Kaneko discloses the keywords “silica” and “hydroxyl group density.” Absent any suggestions in the references themselves to combine their disclosures, an ordinarily skilled artisan given Adams as a guide, would not be lead to the disclosure of Kaneko as alleged by the Office Action.

The motivation for combining the cited references, as stated in the Office Action, is that “the use of fine silica with a low total surface hydroxyl group density helps prevent cracking and fractures, which is extremely desirable in the art.” It is unclear from this statement which “art” the Office Action refers to. While Applicants agree that the use of fine silica with a low total surface hydroxyl group density helps prevent cracking and fractures *in ceramic products* formed using the fine silica (as taught by Kaneko), Applicants do not consider such a statement to set forth a motivation for combining the cited references. The statement in the Office Action seems to erroneously imply that the disclosures of Adams and/or Kaneko suggest that it is desirable in the nonanalogous art distinct art of chemical-mechanical polishing to prevent cracking and fractures -- despite the fact that Adams does not teach or even remotely suggest a desire to reduce cracking or fracturing of anything, let alone something to do with chemical-mechanical polishing, and Kaneko does not remotely suggest that the fine silica could reduce cracking or fracturing in anything besides ceramic products. Indeed, since the silica in chemical-mechanical polishing is not itself formed into

anything, there is no analogous silica product to even prevent the cracking and fracture of in the context of the chemical-mechanical polishing disclosed by Adams. In view of the forgoing, the statement of "motivation" set forth in the Office Action for the alleged combination has no basis of support in the cited references and is entirely unfounded.

Given that the disclosure of Adams lacks any guidance regarding the type of metal oxide to be used in a method of polishing a substrate, and given that the disclosure of Kaneko lacks any suggestion that the silica starting material used for producing ceramics could be used in a method of polishing, one of ordinary skill in the art would not be motivated to combine the cited references, except with the improper hindsight of the present invention.

(b) There Is No Reasonable Expectation of Success

Even if the ordinarily skilled artisan were provided with the combination of Adams and Kaneko, there would have been no reasonable expectation of success that the use of a fine silica having 0.2 to 4 hydroxyl groups per nm² would be advantageous in a method of polishing a substrate. As discussed above, neither Adams nor Kaneko teaches or suggests that the use of a metal oxide having a low hydroxyl group density in a method of polishing is desirable, or even possible. In the absence of such a teaching or suggestion, the ordinarily skilled artisan would not have had a reasonable expectation that the combination of the teachings of the cited references would result in a successful method of polishing a substrate comprising a metal, metal oxide, metal composite, or mixture thereof.

(c) The Cited References Do Not Teach or Suggest All the Claim Limitations

The cited references, either alone or in combination, fail to teach or suggest all the elements of the invention as recited in the pending claims. In particular, the cited references do not disclose a method of polishing a substrate comprising the use of a metal oxide having a surface hydroxyl group density of no greater than about 3 hydroxyl groups per nm². Adams does not even remotely recognize the importance of surface hydroxyl group density of the metal oxide abrasive, let alone disclose that a hydroxyl group density of no greater than about 3 is desirable. Kaneko discloses a fine silica ceramic starting material having 0.1 to 8 hydroxyl groups/nm², preferably 0.2 to 4 hydroxyl groups/nm². Although Kaneko discloses a broad range of hydroxyl group density for the metal oxide ceramic starting material, Kaneko does not recognize the particular benefits of a surface hydroxyl group density of no greater than about 3 hydroxyl groups/nm² as recited in the appealed claims. Thus, even if Adams and Kaneko are combined, the present invention, as defined by the appealed claims, does not necessarily result.

In re Appln. of Dirksen et al.
Application No 09/737,905

For the foregoing reasons, the Patent Office has not made out a prima facie obviousness rejection. The Patent Office has not shown a clear and particular suggestion or motivation in the prior art to combine the disclosures of the cited references, let alone that such a combination would necessarily result in the claimed invention, which would be reasonably expected by one of ordinary skill in the art to function successfully. Accordingly, the Section 103(a) rejection is improper and should be withdrawn as to all the pending claims.

Conclusion

In view of the above, Appellants respectfully urge that the Examiner's rejections be reversed.

Respectfully submitted,


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Date: December 20, 2002

CERTIFICATE OF MAILING

I hereby certify that this APPELLANTS' BRIEF ON APPEAL (along with any documents referred to as being attached or enclosed) is being deposited with the United States Postal Service on the date shown below with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, Washington, D.C. 20231.

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TC 1700

In re Appln. of Dirksen et al.
Application No 09/737,905



APPENDIX - PENDING CLAIMS ON APPEAL

A method of polishing or planarizing a substrate comprising abrading at least a portion of the surface of a substrate comprising a metal, metal oxide, metal composite, or mixture thereof, with a composition comprising a metal oxide abrasive and a liquid carrier, wherein the composition has a pH of about 7 or less and the metal oxide abrasive has a total surface hydroxyl group density no greater than about 3 hydroxyl groups per nm².

2. The method of claim 1, wherein the substrate comprises a metal.
3. The method of claim 2, wherein the metal of the substrate is selected from the group consisting of copper, aluminum, titanium, tungsten, gold, platinum, iridium, ruthenium, and combinations thereof.
4. The method of claim 3, wherein the metal of the substrate is tungsten.
5. The method of claim 1, wherein the substrate comprises a metal oxide.
6. The method of claim 5, wherein the metal oxide of the substrate is selected from the group consisting of alumina, silica, titania, ceria, zirconia, germania, magnesia, and combinations thereof.
7. The method of claim 6, wherein the metal oxide of the substrate is silica.
8. The method of claim 1, wherein the substrate comprises a metal composite.
9. The method of claim 2, wherein the metal composite of the substrate is titanium nitride, tungsten nitride, and nickel-phosphorus.
10. The composition of claim 1, wherein the metal oxide abrasive is selected from the group consisting of alumina, silica, titania, ceria, zirconia, germania, magnesia, and combinations thereof.
11. The composition of claim 10, wherein the metal oxide abrasive is silica.

12. The composition of claim 11, wherein the metal oxide abrasive is fumed silica.
13. The method of claim 1, wherein the total surface hydroxyl group density is no greater than about 2.8 hydroxyl groups per nm².
14. The method of claim 13, wherein the total surface hydroxyl group density is no greater than about 2.5 hydroxyl groups per nm².
15. The method of claim 1, wherein the pH of the polishing composition is about 6 or less.
16. The method of claim 15, wherein the pH of the polishing composition is about 5 or less.